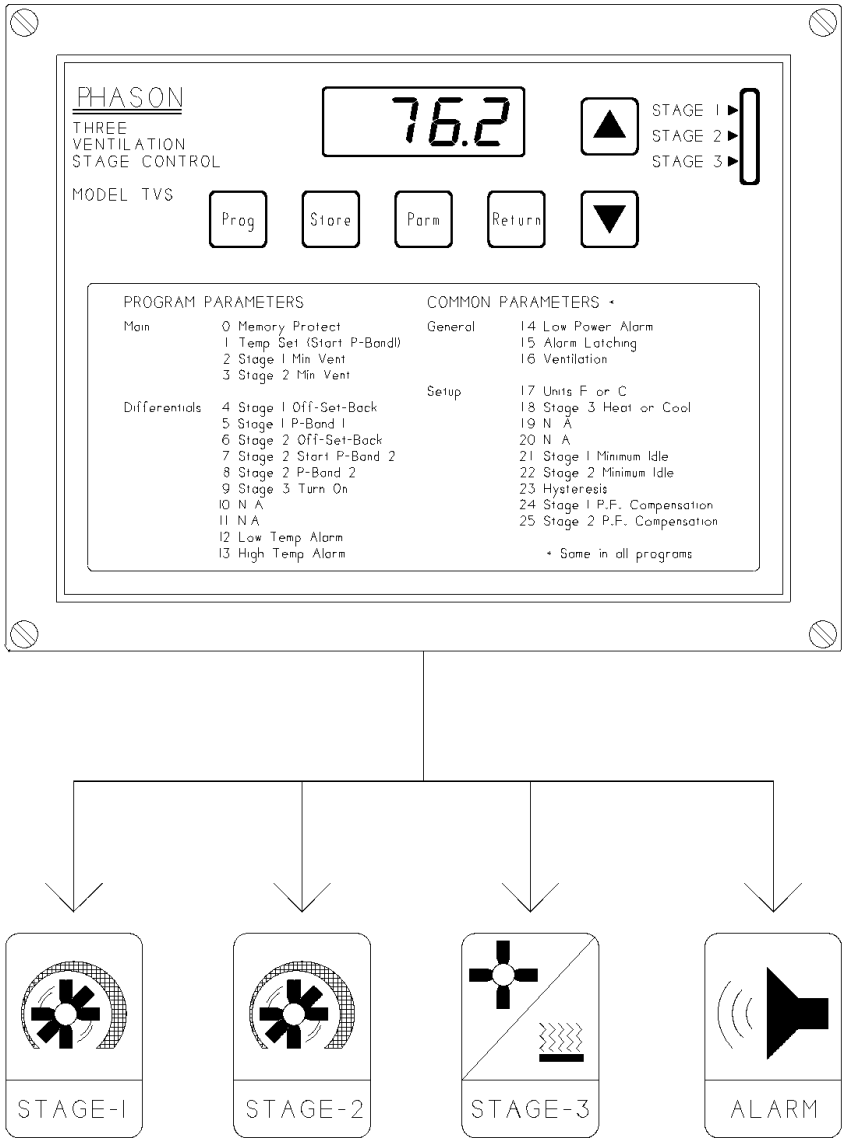
# Three Ventilation Stage Control

# TVS user manual



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# LIMITED WARRANTY

This warranty applies only to the Automatic Environment Control (TVS). If you need warranty service, return the product and original proof of purchase to your dealer.

Phason Inc. (Phason) warrants this product subject to the following terms and conditions.

This warranty is valid only to the original purchaser of the TVS, for two years from the manufacturing date. The manufacturing date is stated in the first eight digits of the serial number in the form year-month-day.

Phason hereby warrants that should the TVS fail because of improper workmanship, Phason will repair the TVS, effecting all necessary parts replacements without charge for either parts or labor.

### Conditions

- Installation must be done according to our enclosed installation instructions.
- The TVS must not have been previously altered, modified, or repaired by anyone other than Phason.
- The TVS must not have been involved in an accident, misused, abused, or operated or installed contrary to the instructions in our user and/or installation manuals. Phason's opinion about these items is final.
- The person requesting warranty service must be the original purchaser of the TVS, and provide proof of purchase upon request.
- All transportation charges for products submitted for warranty must be paid by the purchaser.

Except to the extent prohibited by applicable law, no other warranties, whether expressed or implied, including warranties of merchantability and fitness for a particular purpose, shall apply to the TVS. Any implied warranties are excluded.

Phason is not liable for consequential damages caused by the TVS.

Phason does not assume or authorize any representatives, or other people, to assume any obligations or liabilities, other than those specifically stated in this warranty.

Phason reserves the right to improve or alter the TVS without notice.

## Service and technical support

Your dealer will be happy to answer all technical questions that will help you use the TVS

Before contacting your dealer or Phason, check the following:

- Read this manual for information about the feature with which you are having trouble.
- If you still have a problem with the TVS, collect the following information:
  - Model/serial number
  - A description of the problem

**My dealer's name:** _____

**How to contact my dealer:**

Street/PO Box _____

City _____

State/Province _____

Zip/Postal _____

Phone _____

Fax _____

E-mail _____

Web site _____


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# Features of the TVS

The Three Ventilation Stage Control (TVS) is a microprocessor-based product designed to efficiently control the environment in livestock buildings. It connects to two variable speed fans, a secondary fan or heater and an alarm system. When operating, the TVS measures and displays the room temperature. While monitoring the temperature, it controls the connected ventilation and heating equipment according to the programmed settings to keep the temperature at the desired point. The program settings may be adjusted to change the turn on points and other parameters of the stages. This is a list of the standard features of the TVS.

- Digital display of temperature, alarms and settings
- 7 programs with pre-programmed factory settings that can be easily changed
- A built-in keyboard to allow easy adjustment of settings
- 1 stage with a user definable relay contact to control secondary fans or heaters
- A relay to signal high or low temperature, power interruptions or low line voltage conditions
- Internal memory is retained during power failures
- 115/230 VAC operation @ 7.5 full load amps output for each variable speed fan (with RFI noise suppressors to eliminate radio and T.V. interference)
- 3 second full power turn on for variable speed outputs to minimize fan freeze-up
- Transient protected
- Compact design, 18cm/7" (H) x 23cm/9" (W) x 9.5cm/3.75" (D)
- Non-corrosive, fire retardant enclosure
- 2-year warranty
- Extendable sensor

# Getting started

Congratulations on the purchase of your new TVS environment control! This manual has been prepared to help you get the utmost in satisfaction from your TVS. It contains detailed information regarding the installation and operation of the control. The Getting Started section will step you through the installation and configuration of your TVS. The following steps refer to other sections of this user's guide for additional information. Therefore, it is not necessary to read the entire document from front to back, but rather in the order that the information is needed.

STEP **1**

**CHECKING RATINGS OF EQUIPMENT**

- Read the TVS ELECTRICAL RATINGS on page 4.
- Fill in the EQUIPMENT LIST on page 5.

WARNING: The equipment to be connected to the TVS control must not draw more current than the TVS stages are rated for. Use of equipment that is rated higher than the TVS will result in damage to the control and will void the warranty.

STEP **2**

**INSTALLATION**

- Follow the instructions in Appendix A for installing and wiring the TVS and equipment. Be sure to read the General Warnings section in Appendix A before installation.

STEP **3**

**TESTING**

- Follow the instructions in Appendix B for testing the operation of the equipment installed to ensure that it is connected properly.

STEP **4**

**SETTING UP**

- Read through the GETTING TO KNOW THE TVS section on page 6 and get familiar with the programming procedures.
- Read the SETUP section on page 11.
- Configure the TVS according to the type of equipment connected.
- Mark the changes in the Blank Program Tables in Appendix D.

STEP **5**

**PUTTING CONTROL INTO SERVICE**

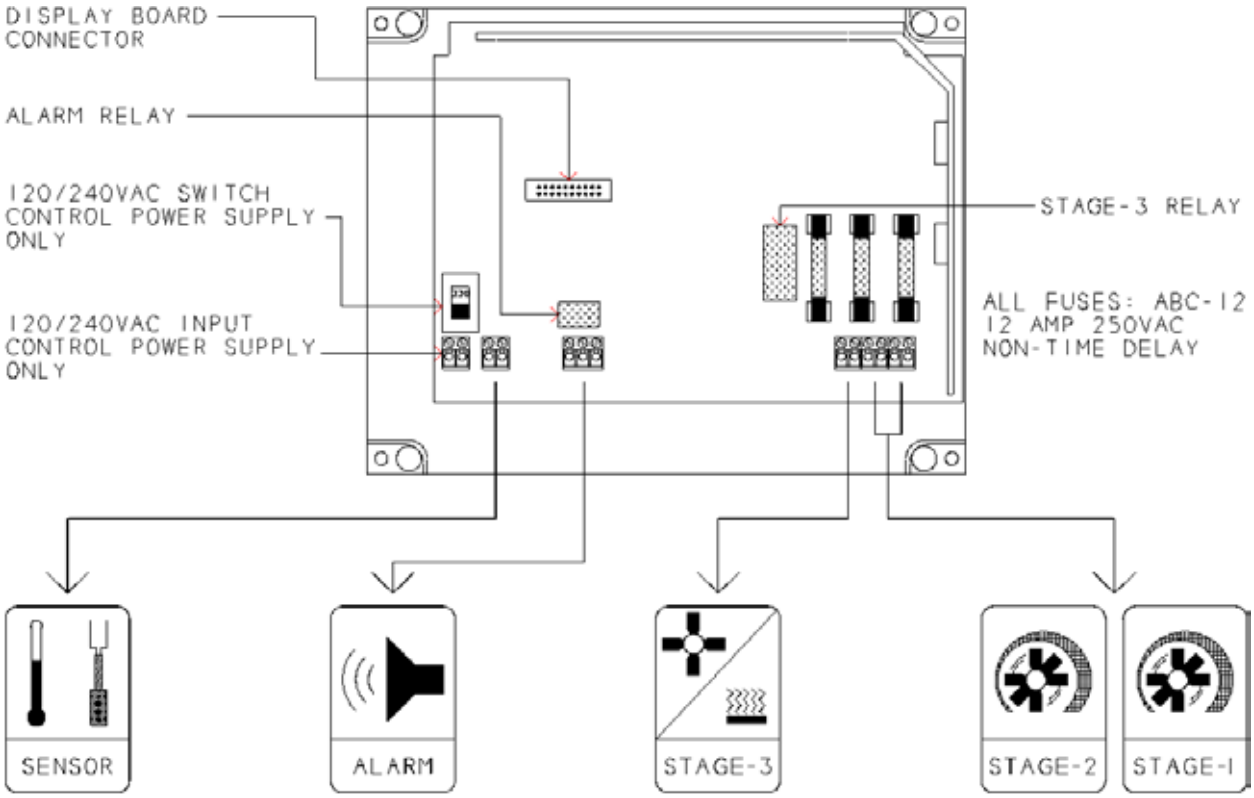
- Read the TVS OPERATION section on page 15.
- Select the most useful factory program; see page 20.
- Make changes to the program as desired; see page 9.
- Mark the changes in the Blank Program Tables in Appendix D.

STEP **6**

**METHODS OF USE**

- Read the METHODS OF USE section on page 21.

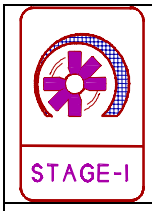
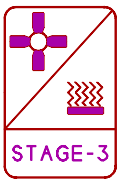
# TVS electrical ratings




| TEMP SENSOR | ALARM RELAY RATINGS: | STAGE 3 MAXIMUM RATINGS: | VARIABLE SPEED STAGES MAXIMUM RATINGS: |
|---|---|---|---|
| Standard 30 foot sensor | 0.2 Amps, 230 VAC<br>0.4 Amps, 24 VAC<br>2 Amps, 30 VDC for resistive loads | 6 FLA (full load amps)<br>115 or 230 VAC | 7.5 FLA (full load amps) each<br>115 or 230 VAC |

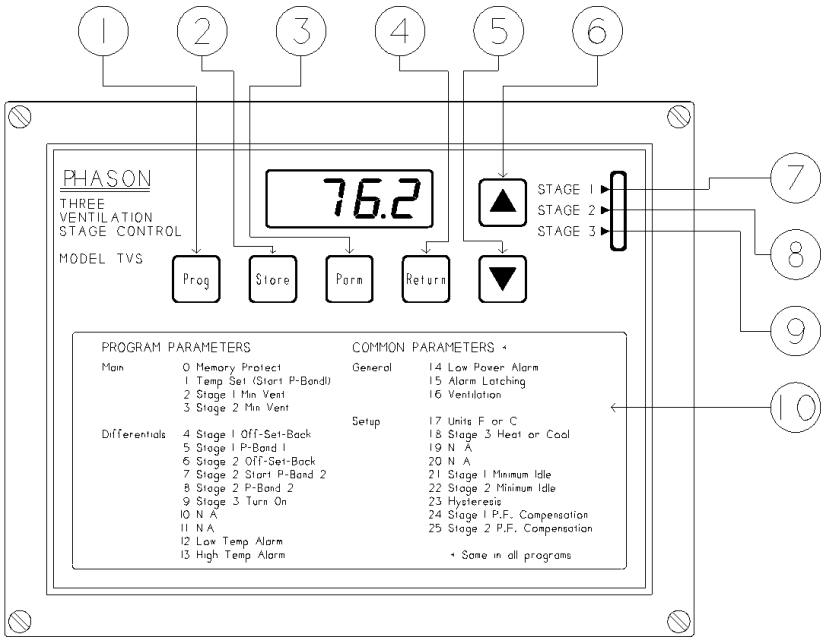
NOTE: This is not a wiring diagram. All wiring diagrams are located in Appendix A.

# Equipment list

| | | | |
|---|---|---|---|
|  | **Variable Speed Stage 1** | Make and Model # of fan(s): | |
| | | Max. Total Current Draw of fan(s): Must not be greater than 7.5 amps. | |
| | | Operating Voltage: | |
| | **Variable Speed Stage 2** | Make and Model # of fan(s): | |
| | | Max. Total Current Draw of fan(s): Must not be greater than 7.5 amps. | |
| | | Operating Voltage: | |
|  | **Cool/Heat Stage 3** | Make and Model # of fan/heater: | |
| | | Max. Total Current Draw: * | |
| | | Operating Voltage: | |
| | **Alarm** | Alarm relay connected to: | |

* A power contactor must be used if the maximum total current draw is greater than the maximum ratings of the relay. See the maximum ratings on page 4.

# Getting to know the TVS




1) PROGRAM button - used to select the desired operating program.
2) STORE button - used to save selected programs and parameter settings in memory.
3) PARAMETER button - used to scroll through the parameter list.
4) RETURN button - used to bring the control back to normal operation.
5) DOWN button - used to adjust a parameter.
6) UP button - used to adjust a parameter.
7) STAGE 1 indicator light.
8) STAGE 2 indicator light.
9) STAGE 3 indicator light.
10) Complete parameter list.

## Definition of terms

NORMAL OPERATION — The TVS is in normal operation when it is displaying room temperature. When alarms occur, the display will alternately flash the alarm signal and room temperature.

PROGRAMS — Programs consist of the Main, Differential, General and Setup parameters. The TVS has seven programs that can be selected and reprogrammed by the user.

OPERATING PROGRAM — The TVS operates according to the parameters in the operating program. Any one of the seven programs may be selected as the operating program.

PARAMETER LIST — The parameter list is shown on page 19, and is printed on the front of the TVS control. It is a list of all the parameters that may be programmed by the user.

PARAMETERS — Parameters are the individual settings that may be programmed. Read the PARAMETER DESCRIPTIONS section on page 16 for an explanation of each parameter. There are four categories of parameters:

1) Main: Main parameters control the main operation of the control.

2) Differential: These parameters are programmable differentials. They are the number of degrees above or below the temperature set point the particular stage starts or turns on.

3) General: General parameters are common to all programs. These parameters can have only one setting which is the same in all programs.

4) Setup: Setup parameters control the overall operation of the unit. These parameters can have only one setting which is the same in all programs.

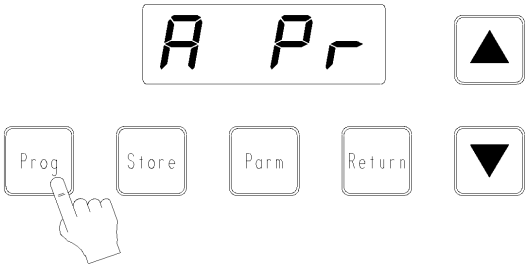
# Adjusting the TVS

## Selecting a new operating program

As livestock mature, often the room climate needs to be changed. The TVS has seven different programs in memory for seven different climate settings. Any one of these programs can be the operating program. In order to change the operating program of the TVS, follow the instructions below. For a list of the factory settings see Table 2 on page 20.

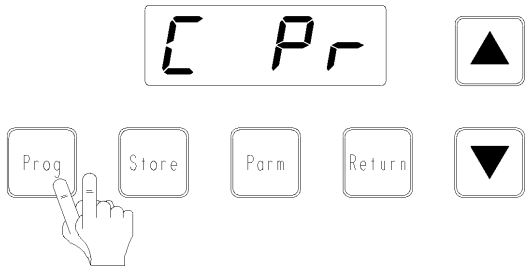
1) Press the **PROG** button once.

   The TVS will display the current operating program (one of A, b, C, d, E, F or g). The display will flash the program name and Pr.



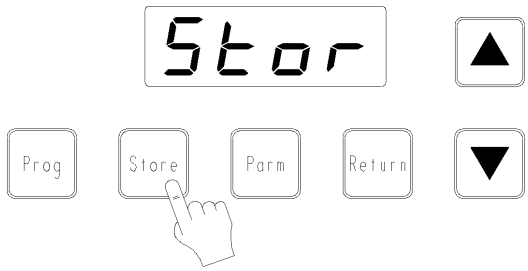

2) Press the **PROG** button several times until the desired program is displayed.

   By pressing the **PROG** button, the program names are displayed one after another. To change to a different operating program, press the **PROG** button until the proper program is displayed.




3) Press the **STORE** button to enter the desired program into memory.

   When the correct program is displayed, pressing the **STORE** button will tell the TVS to use the selected program as the operating program. After Stor is displayed, the TVS returns to normal operation.

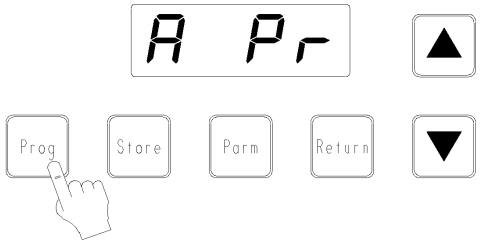


## Changing parameter settings

Follow the steps below to view and/or edit the parameters in any program. After editing the parameters, mark the changes in the Blank Program Tables in Appendix D for future reference.

1) Press the **PROG** button until the program that you want to edit is displayed.

   The display will flash the program letter (A to g) and Pr.

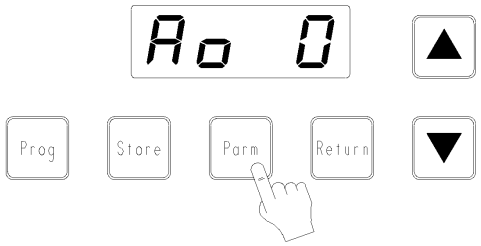



2) Press the **PARM** button once.

   The first (left-most) digit shows the program letter that is being edited.

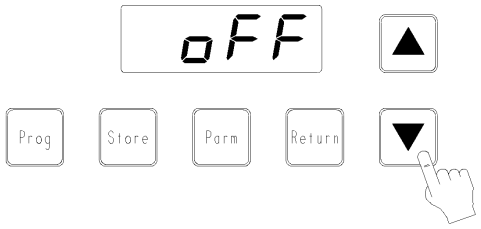
   The second digit indicates if the program is the operating program. An o means the program is the operating program, a blank means it is not the operating program.

   The two right-most digits show the parameter number to be edited.

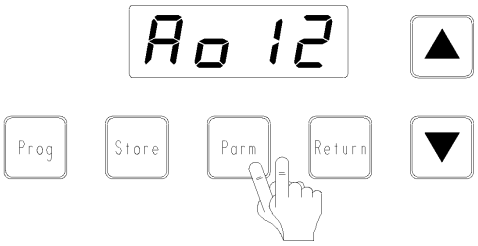



3) Press the **UP** or **DOWN** key to turn memory protect off.

   The display will show Ao 0 and then oFF, indicating memory protect has been turned off. The parameters can now be adjusted. If memory protect is not turned off, the parameters can only be viewed. Attempting to adjust the parameters while memory protect is on will result in an Err message being displayed.

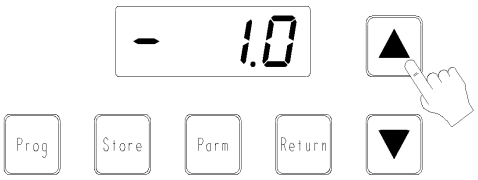


4) Press the **PARM** button to step through the parameter list until the desired parameter is reached.
Refer to the front cover of the TVS control or see Table 2 on page 20 for the parameter list.



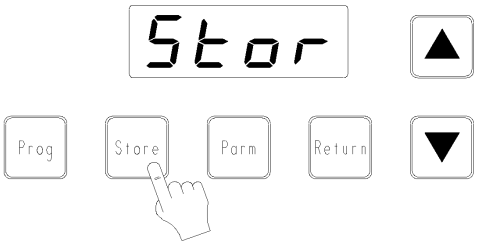

5) Use the **UP** / **DOWN** buttons to adjust the setting.

The parameter can be adjusted to any value with in the parameter's range. The ranges can be found on page 19.



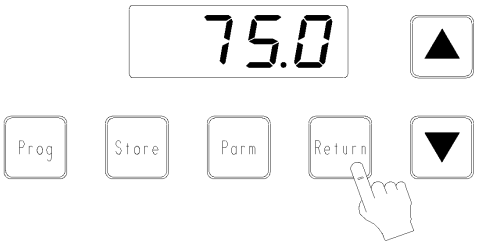

6) Press **STORE** to save the setting in memory.

The display will show **Stor** for 1 second indicating the new setting has been stored in memory. If the **PARM** button is pressed before pressing **STORE** the next parameter will appear and the previous one will change back to its previous setting.
Continue through the parameter list by pressing the **PARM** button and making changes to the settings where needed.
Follow the same procedure shown in steps 4 to 6 above.




7) To return to normal operation (displaying of room temperature) at any time, press the **RETURN** button.

When **RETURN** is pressed, memory protect is automatically turned back on. If a parameter has been changed but the value has not been stored, pressing **RETURN** will change the parameter's setting to the last stored setting and return the control to normal operation.




NOTE: If the TVS is left displaying a parameter it will revert back to normal operation in 1 minute automatically. If **STORE** was not pressed the displayed parameter will change back to its previous value.

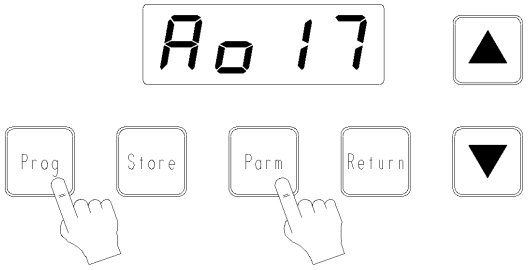
# Setup parameters

The setup parameters should be programmed when the installation has been completed to configure the TVS, and then generally the parameters do not need to be reprogrammed. These parameters are different from the other parameters because they do not have a different setting for each program and cannot be edited in the normal way. Each setup parameter setting is common to all programs. Follow the instructions below to change the setup parameters.

When the setup parameters have been programmed, the blank program table in Appendix D should be filled in with the new settings for future reference.

### To edit the setup parameters

Press the **PARM** button once to enter the edit mode. If you wish to edit the setup parameters, you must turn off the memory protect now. See page 9 to turn off the memory protection.

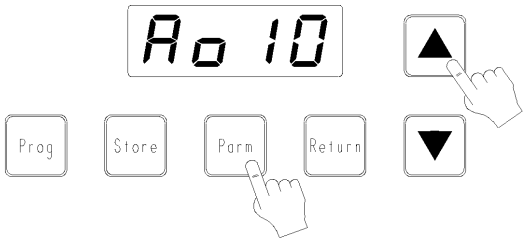



Next, press the **PROG** and **PARM** buttons simultaneously to get to the setup parameters. The Setup parameters can be adjusted as needed and stored in the same way the normal parameters can. After the setup parameters have been changed and stored, press the **RETURN** button to return to normal operation.

# Programming tips

### Scrolling backwards

When viewing or editing the parameters, sometimes it is helpful to scroll backwards through the parameter list. To do this, press the **PARM** and **UP** buttons simultaneously. Instead of the TVS displaying the next parameter on the list, it will display the previous parameter.



### Selecting a parameter to edit

The parameters are stored in a table in memory that is similar to the Factory Program Table on page 20. Any parameter in any program can be edited when memory protection has been turned off. Follow these procedures when editing parameters to become more efficient.

To move down to the next parameter press the **PARM** button.

To move up or backwards to the previous parameter, press the **PARM** and **UP** buttons simultaneously.

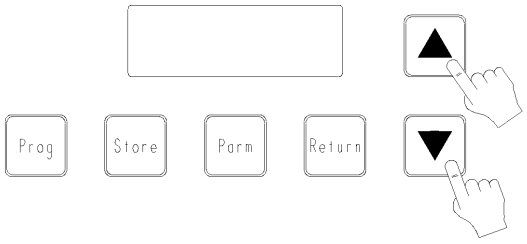
To move right, press the **PROG** button until the desired program is displayed, then press the **PARM** button once to edit the same parameter number that was being edited before.

| To Move | Button(s) |
|---|---|
| ↓ | **PARM** |
| ↑ | **PARM** and **UP** |
| → | **PROG** |

An example of where this method of programming is useful is a situation where the temperature set point of each program needs to be changed. This can done by turning off memory protection and changing the temperature set point in the operating program (the operating program is displayed with an o and the program name). Then press the **PROG** button twice to edit the next program. Press the **PARM** button and edit the parameter. To continue to the next program press the **PROG** button twice again. Remember that **STORE** must be pressed after each change to save the new setting in memory.

### Fast editing

When editing the setting of a parameter by adjusting it up or down, hold down either button and then press the other one. This will change the setting ten times faster. If you want to increase the setting, hold down the **UP** button and then press the **DOWN** button. The setting will increase ten times faster. To decrease the setting ten times faster, hold down the **DOWN** button and then press the **UP** button.



## Reloading the factory programs

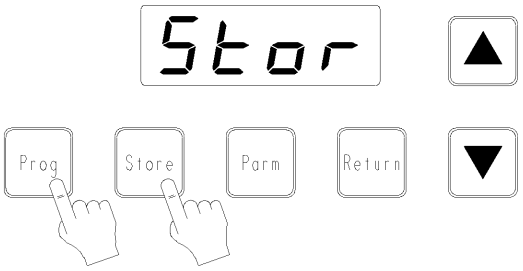
The factory programs can be reloaded, if so desired, to replace the existing program. If the existing programs are not operating properly or need to be changed back to the original factory programs, follow the steps below to reload the factory programs.

When reloading the factory programs, the existing programs including the setup parameters are replaced. The TVS will begin with program A as the operating program. The parameters in all programs and most importantly the setup parameters will need to be reprogrammed for the equipment that is connected. Pay close attention to the setup parameter for stage 3.

1) Turn off the power to the TVS.

2) Hold down the **PROG** and **STORE** buttons.

3) While holding the buttons down, turn the power back on. The display will flash Stor for two seconds and then the TVS will be in the normal operating mode, displaying the room temperature and a power failure alarm.



# TVS operation

Figure 2 shows the operation of each stage of the TVS. This particular diagram shows the temperatures at which the stages would turn on and off if the TVS was operating according to the factory settings in program A. Some settings are listed here but the entire factory program table can be found on page 20. The circled numbers in the diagram correspond to the parameter numbers. Use these numbers to cross reference the parameters in the diagram to their descriptions. All stages except the low temperature and high temperature alarms have a programmable hysteresis, parameter # 23.

PARAMETER SETTINGS

| | |
|---|---|
| 1 Temp Set | 85.0°F |
| 2 Stage 1 Min Vent | 20% |
| 3 Stage 2 Min Vent | 20% |
| 4 Stage 1 OSB | -3.0 |
| 5 Stage 1 P-Band1 | 2.0 |
| 6 Stage 2 OSB | 0.0 |
| 7 Stage 2 Start P-Band2 | 2.0 |
| 8 Stage 2 P-Band | 2.0 |
| 9 Stage 3 Turn On | 5.0 |
| 12 Low Temp Alarm | -3.0 |
| 13 High Temp Alarm | 10.0 |

NOTE: When the variable speed stages turn on, they will run full speed for three seconds and then decrease to the required speed.

EXAMPLE

As an example, say the temperature is 75°F and rising. At this point the Low Temp Alarm will be on. When the temperature rises to 82 °F, the Low Temp Alarm will turn off and the Stage 1 fan will turn on. The Stage 1 fan will run at full speed for three seconds and then slow down to the Minimum Ventilation setting.

At 85°F the Stage 1 P-Band begins. While the temperature rises in the P-Band, the Stage 1 fan will increase in speed. At 87 °F Stage 1 will be at full speed.

When the temperature rises to 88 °F the Stage 2 P-Band begins. Since the Stage 2 fan has been off until now, it will run full speed for three seconds and then slow down to the required speed. As the temperature rises, the Stage 2 fan will increase in speed proportionally to the temperature. At 90 °F the Stage 2 fan will be at full speed.

At 90 °F Stage 3 (cool) will turn on.

When the temperature rises to 95 °F the High Temp Alarm will turn on.

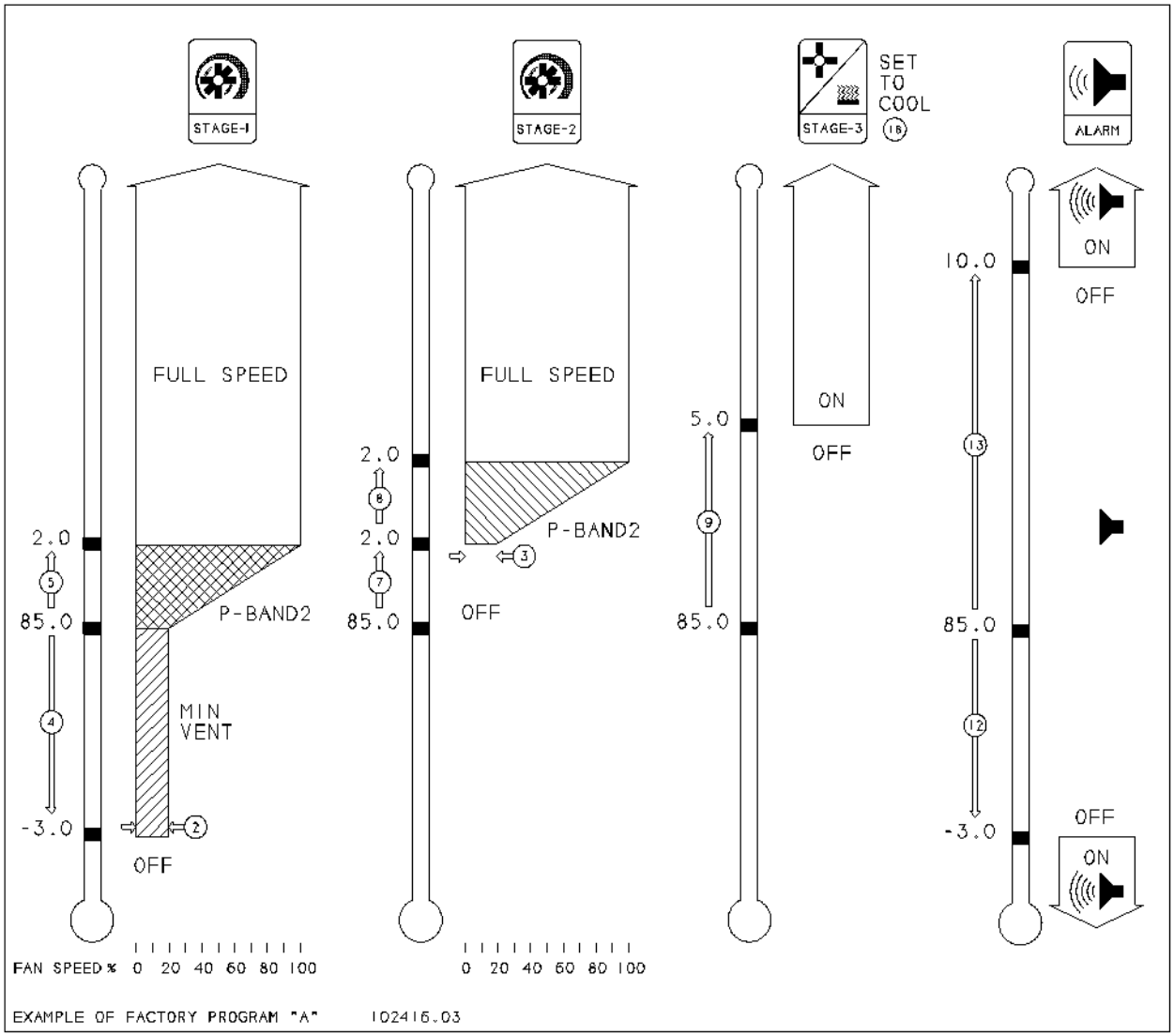



**Figure 2**: TVS Operation diagram. Circled numbers correspond to the parameter numbers.

## Parameter descriptions

MAIN PARAMETERS

**0** **MEMORY PROTECT** [On/Off] - ensures parameters are not changed by accident. Memory protect must be turned off every time the parameters are edited. The memory protect parameter can not be stored and is turned on automatically when the control is returned to normal operation.

**1** **TEMPERATURE SET (Start P-Band 1)** [32.0 - 110.0°F, 0.0 - 43.3°C] - is the target room temperature. All differentials and alarms are referenced to this setting. It is the starting point of the Stage 1 P-Band1 (parameter #5).

**2** **STAGE 1 MINIMUM VENTILATION** [Minimum Idle (#21) - 99] - is the idle speed in % of full power at which the Stage 1 fan will idle. It cannot be adjusted below the setting of the Minimum Idle (#21) parameter.

**3** **STAGE 2 MINIMUM VENTILATION** [Minimum Idle (#22) - 99] - is the idle speed in % of full power at which the Stage 2 fan will idle. It cannot be adjusted below the setting of the Minimum Idle (#22) parameter.

DIFFERENTIALS

**4** **STAGE 1 OFF-SET-BACK** [IDLE, -20.0 - 0.0° F, -11.1 - 0.0° C] - is a range of degrees below the temp set where the Stage 1 fan will be at idle speed, and below this range the fan will be off. Idle means the fan will run at the Min Vent setting at all temperatures below the temp set. If Temp Set (#1) is set to 80° F and Stage 1 Off-Set-Back (#4) is set at -8° F the fan will idle when the temperature is between 80° F and 72° F, and will be off below 72°F.

**5** **STAGE 1 P-BAND1** [0.0 - 16.0° F, 0.0 - 8.9° C] - The proportional band is a range of degrees above the Temp Set where the Stage 1 fan increases in speed proportionally to the temperature. If Temp Set (#1) is set to 80° F and Stage 1 P-Band1 (#5) is set at 5° F the variable speed fan will start to increase speed at 80° F and will be at full speed at 85° F.

**6** **STAGE 2 OFF-SET-BACK** [IDLE, -20.0 - 0.0° F, -11.1 - 0.0° C] - is a range of degrees below the Stage 2 Start P-Band2 (#7) where the Stage 2 fan will be at idle speed, and below this range the fan will be off. Idle means the fan will run at the Min Vent setting at all temperatures below Stage 2 Start P-Band2 (#7). If Temp Set (#1) is set to 80° F, Stage 2 Start P-Band2 (#7) is set to 10° F and Stage 2 Off-Set-Back (#6) is set at –3° F, the Stage 2 fan will idle between 90° F and 87° F and will be off below 87° F.

**7** **STAGE 2 START P-BAND2** [-10.0 - 15.0° F, -5.5 - 8.4° C, OFF] - is the number of degrees above or below the Temp Set at which the Stage 2 proportional band starts. All Stage 2 differentials are with respect to this setting. If the Temp Set (#1) is 80° F and this parameter (#7) is set to 10° F, the Stage 2 fan will turn on at 90° F.

**8 STAGE 2 P-BAND2** [0.0 - 16.0° F, 0.0 - 8.9° C] - The proportional band is a range of degrees above the Stage 2 Start P-Band2 where the Stage 2 fan will increase in speed proportionally to the temperature. If Temp Set (#1) is set to 80° F, Stage 2 Start P-Band2 (#7) is set to 10° F and Stage 2 P-Band2 (#8) is set at 5° F, the Stage 2 variable speed fan will start to increase speed at 90° F and will be at full speed at 95° F.

**9 STAGE 3 TURN ON** [-10.0 - 15.0° F, -5.5 - 8.4° C, OFF] - The number of degrees above or below the Temp Set at which Stage 3 will turn on. If the Temp Set (#1) is set to 80° F and On Stage 3 (#9) is set to 5° F, Stage 3 will turn on at 85° F. The Stage 3 Operation (#18) parameter regulates what mode Stage 3 operates as (heat or cool).

**10 Not Applicable**

**11 Not Applicable**

**12 LOW TEMPERATURE ALARM** [OFF, -36.0 - 0.0° F, -20.0 - 0.0° C] - The number of degrees below the Temp Set that a low temperature alarm will be generated (A Lt). This alarm may be disabled by adjusting it to OFF.

**13 HIGH TEMPERATURE ALARM** [0.0 - 36.0° F, 0.0 - 20.0° C, OFF] - The number of degrees above the Temp Set that a high temperature alarm will be generated (A Ht). This alarm may be disabled by adjusting it to OFF.

GENERAL PARAMETERS

General parameters have one setting common to all programs. When they are changed in one program, they change in all programs.

**14 LOW POWER ALARM** [ON - OFF] - When the line voltage drops below the proper operating level a low power alarm will be displayed (A LP). This alarm may be disabled by adjusting it to OFF. When disabled, the display will still flash A LP but the alarm relay will not activate.

**15 LATCHING ALARMS** [ON - OFF] - When this parameter is turned ON, all alarms will be displayed on the TVS and will continue to flash after the alarm condition is gone. They can be reset by pressing the RETURN button. This feature is useful to keep track of the alarms that occur during times when the control is not being supervised. For example; in the morning, the TVS could be checked for alarms that occurred during the night and then the alarms could be cleared. If this parameter is turned OFF, the display will only show the alarm when the condition is present. When the alarm condition is gone, the alarm will no longer be displayed.

**16 VENTILATION** [ON - OFF] - When this parameter is turned OFF, the variable speed outputs and cooling stages are turned off completely and all alarms will not be displayed. The heating stages are not affected. Ventilation may be turned OFF when a room is vacant to conserve energy. When it is turned OFF the TVS will display VoFF. DO NOT use this to shut down fans to work on the wiring - ensure the breakers are turned off.

SETUP

The setup parameters are common to all programs and can only have one setting. They can not be accessed by the same procedure as the normal parameters. This has been done to protect these parameters from accidentally being changed. Follow the instructions on page 11 to reprogram these parameters.

**17 TEMPERATURE UNITS** [$^{o}$F - $^{o}$C] - This parameter programs the TVS to display the temperature in Fahrenheit or Celsius.

**18 STAGE 3 OPERATION** [HEAT - COOL] - This parameter programs the Stage 3 output to operate as a heating stage or a cooling stage. When it is set to HEAT, the stage will be on below the Stage 3 Turn On (parameter #9). If it is set to COOL, the stage will be on above the Stage 3 Turn On (#9).

**19 Not Applicable**

**20 Not Applicable**

**21 STAGE 1 MINIMUM IDLE** [0 - 99] - This is the minimum idle preset in percent of full speed. The Stage 1 Min Vent (#2) cannot be adjusted below this setting. If it is programmed to 20 the Stage 1 Min Vent (#2) parameter cannot be adjusted below 20. It is recommended that this parameter be programmed to correspond to the lowest speed at which the motor can safely operate.

**22 STAGE 2 MINIMUM IDLE** [0 - 99] - This is the minimum idle preset in percent of full speed. The Stage 2 Min Vent (#3) cannot be adjusted below this setting. If it is programmed to 20 the Stage 2 Min Vent (#3) parameter cannot be adjusted below 20. It is recommended that this parameter be programmed to correspond to the lowest speed at which the motor can safely operate.

**23 HYSTERESIS** [0.5 - 2.5$^{o}$F, 0.3 - 1.4$^{o}$C] - This is the number of degrees of difference between the turn-on point and turn-off point for all stages. It is the number of degrees above the turn-on point that a heating stage will turn off, and the number of degrees below the turn-on point that a cooling stage will turn off.

**24 STAGE 1 POWER FACTOR COMPENSATION** [0.5 - 2.5] - This is set at the factory to 1.0 and should only be adjusted if the Stage 1 variable speed fan does not operate properly with the TVS.

**25 STAGE 2 POWER FACTOR COMPENSATION** [0.5 - 2.5] - This is set at the factory to 1.0 and should only be adjusted if the Stage 2 variable speed fan does not operate properly with the TVS.

## Parameter ranges

| # | PARAMETERS | RANGE | |
|---|---|---|---|
| | **MAIN** | °F | °C |
| 0 | Memory Protect | ON / OFF | |
| 1 | Temp Set (Start P-Band1) | 32.0 to 110.0 | 0.0 to 43.3 |
| 2 | Stage 1 Min Vent | Min Idle (parm #21) – 99 | |
| 3 | Stage 2 Min Vent | Min Idle (parm #22) – 99 | |
| | **DIFFERENTIAL** | | |
| 4 | Stage 1 Off-Set-Back | IDLE, -20.0 to 0.0 | IDLE, -11.1 to 0.0 |
| 5 | Stage 1 P-Band1 | 0.0 to 16.0 | 0.0 to 8.9 |
| 6 | Stage 2 Off-Set-Back | IDLE, -20.0 to 0.0 | IDLE, -11.1 to 0.0 |
| 7 | Stage 2 Start P-Band2 | -10.0 to 15.0, OFF | -5.5 to 8.4, OFF |
| 8 | Stage 2 P-Band2 | 0.0 to 16.0 | 0.0 to 8.9 |
| 9 | Stage 3 Turn On | -10.0 to 15.0, OFF | -5.5 to 8.4, OFF |
| 10 | Not Applicable | | |
| 11 | Not Applicable | | |
| 12 | Low Temp Alarm | OFF, -36.0 to 0.0 | OFF, -20.0 to 0.0 |
| 13 | High Temp Alarm | 0.0 to 36.0, OFF | 0.0 to 20.0, OFF |
| | **GENERAL** | | |
| 14 | Low Power Alarm | ON / OFF | |
| 15 | Alarm Display Latching | ON / OFF | |
| 16 | Ventilation | ON / OFF | |
| | **SETUP** | | |
| 17 | Units °F or °C | °F / °C | |
| 18 | Stage 3 Operation | HEAT / COOL | |
| 19 | Not Applicable | | |
| 20 | Not Applicable | | |
| 21 | Stage 1 Minimum Idle | 0 to 99 | |
| 22 | Stage 2 Minimum Idle | 0 to 99 | |
| 23 | Hysteresis | 0.5 to 2.5 | 0.3 to 1.4 |
| 24 | Stage 1 P.F. Compensation | 0.5 to 2.5 | |
| 25 | Stage 2 P.F. Compensation | 0.5 to 2.5 | |

**Table 1**: Adjustable ranges of parameters

## Factory programs

The TVS is programmed with the factory settings as shown below. See the ADJUSTING THE TVS section for instructions to change the operating program. Select the most useful program and make changes where necessary.

| # | PARAMETERS | PROGRAM NAMES (A - g) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | A | b | C | d | E | F | G |
| | **MAIN** | | | | | | | |
| 1 | Temp Set (Start P-Band1) | 85.0 | 80.0 | 75.0 | 70.0 | 65.0 | 65.0 | 65.0 |
| 2 | Stage 1 Min Vent | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 3 | Stage 2 Min Vent | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| | **DIFFERENTIAL** | | | | | | | |
| 4 | Stage 1 Off-Set-Back | -3.0 | -3.0 | -4.0 | -5.0 | -5.0 | -5.0 | -5.0 |
| 5 | Stage 1 P-Band1 | 2.0 | 2.0 | 2.5 | 3.0 | 3.0 | 3.0 | 3.0 |
| 6 | Stage 2 Off-Set-Back | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 7 | Stage 2 Start P-Band2 | 2.0 | 2.0 | 2.5 | 3.0 | 3.0 | 3.0 | 3.0 |
| 8 | Stage 2 P-Band2 | 2.0 | 2.0 | 2.5 | 3.0 | 3.0 | 3.0 | 3.0 |
| 9 | Stage 3 Turn On (Cool) | 5.0 | 5.0 | 6.0 | 7.0 | 7.0 | 7.0 | 7.0 |
| 10 | Not Applicable | | | | | | | |
| 11 | Not Applicable | | | | | | | |
| 12 | Low Temp Alarm | -3.0 | -4.0 | -5.0 | -5.0 | -5.0 | -5.0 | -5.0 |
| 13 | High Temp Alarm | 10.0 | 10.0 | 12.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| | **GENERAL** | | | | | | | |
| 14 | Low Power Alarm | ON | | | | | | |
| 15 | Alarm Display Latching | ON | | | | | | |
| 16 | Ventilation | ON | | | | | | |
| | **SETUP** | | | | | | | |
| 17 | Units $^{o}$F or $^{o}$C | $^{o}$F | | | | | | |
| 18 | Stage 3 Operation | COOL | | | | | | |
| 19 | Not Applicable | | | | | | | |
| 20 | Not Applicable | | | | | | | |
| 21 | Stage 1 Minimum Idle | 20 | | | | | | |
| 22 | Stage 2 Minimum Idle | 20 | | | | | | |
| 23 | Hysteresis | 0.5 | | | | | | |
| 24 | Stage 1 P.F. Compensation | 1.0 | | | | | | |
| 25 | Stage 2 P.F. Compensation | 1.0 | | | | | | |

**Table 2:** Factory programs

# Methods of use

The TVS has seven programs which can be selected as the operating program. To take advantage of the programs, adjust them for different climate settings. They can be used for different kinds of livestock or used at different stages of maturity of the particular livestock. Time is saved by simply changing the program, instead of adjusting every parameter. Remember to mark all changes to the programs in the Blank Program Tables in Appendix D to keep track of the settings.

# Alarm messages

| Alarm | Description |
|---|---|
| Err | **Err**or - an incorrect key has been pressed |
| A Ht | **A**larm **H**igh **T**emperature - temperature is above the high temp alarm setting |
| A Lt | **A**larm **L**ow **T**emperature - temperature is below the low temp alarm setting |
| A LP | **A**larm **L**ow **P**ower - the line voltage is low |
| A Pd | **A**larm **P**robe **D**isconnect - the temperature sensor is disconnected |
| A PS | **A**larm **P**robe **S**hort - The temperature sensor is short circuited |
| A PF | **A**larm **P**ower **F**ailure - the power has been interrupted |
| A IE | **A**larm **I**nternal **E**rror - indicates an internal error has occurred |
| UoFF | **V**entilation **Off** - ventilation has been turned off in the program |

**Reasons for alarms to activate**

| | |
|---|---|
| Err | The Err message appears when an incorrect key has been pressed or if an attempt has been made to change a parameter while memory protect is on. The Err message will appear for 2 seconds and then disappear. |
| A Ht | The high temperature alarm appears when the room temperature is above the high temperature alarm setting (parameter #13). Check if the fans are operating properly. This alarm may occur on very hot days when the desired room temperature can not be maintained. |
| A Lt | The low temperature alarm appears when the room temperature is below the low temperature alarm setting (parameter #12). Check if the heater is operating properly. |

| | |
|---|---|
| A LP | The low power alarm turns on when the line voltage drops below 190 for 230 VAC operation or below 95 for 115 VAC operation. This indicates a problem with the electrical service of the building. The control may operate erratically if the voltage drops below these levels. |
| A Pd | This indicates the temperature sensor is disconnected. The sensor wire may be broken or damaged somewhere. |
| A PS | This alarm indicates the temperature sensor is short circuited. The sensor or wire may be damaged somewhere. |
| NOTE: When a A Pd or a A PS alarm occurs, the heating and cooling stages will turn off and the variable stages will run at idle speed. | |
| A PF | The Power Failure alarm appears when there has been an interruption in the power. The control will continue to operate normally and the alarm can be cleared by pressing the RETURN button. |
| A IE | When this alarm appears it indicates an internal error has occurred. To clear this alarm check through the parameters; adjust and store the ones that are incorrect. Next, turn the power off and then back on and the alarm will be cleared. |
| NOTE: A parameter must be changed and stored and the power turned off and on before the alarm will be cleared. Another way to clear the alarm is downloading the factory programs. This will reset all the parameters to the factory settings and then they must be programmed to the desired settings again. Consult your dealer or Phason for information to prevent this problem from happening again. | |
| UoFF | VoFF is displayed when VENTILATION (parameter #16), is turned OFF. When this is displayed, the variable speed stages and the cooling stages will be turned off. The heating stage(s) will operate normally. |

# Care and maintenance

Moisture will not cause a problem with the control if the proper care is taken in installation. The control's enclosure is made of fire retardant plastic and is sealed with a rubber gasket. The sensor entry is sealed with a liquid tight cable connector.

Caution should be taken when washing the room with a high pressure washer. **DO NOT** direct a high pressure washer at the control. In order to clean the control, wipe it with a damp cloth.

**Be sure power is off before cleaning to avoid electrical shock.**

MAINTENANCE

1) To prevent damage to the control, after the first two weeks of operation remove the cover from the unit and check for moisture inside. Be sure to turn off the power to the control before opening the cover.

2) If moisture is present, wipe it out with a dry cloth and check the cable entry points and rubber gasket for proper sealing.

3) If the cable connectors are not sealing, apply RTV or Silicon II sealant around the cable.
**WARNING:** If a sealant is used, be aware that some silicone sealants release acetic acid while curing. This can cause corrosion damage to the control. Let silicone cure completely (1 to 3 days), before closing the control or the control may be damaged and the warranty will be VOID.

4) Check the control again after two weeks to verify that it is properly sealed.

The control should be opened and inspected once a year for moisture. Proper care and maintenance will extend the life of the control.

# Power factor correction

Adjusting the P-Band to correct for a particular power factor may improve your ventilation system's performance. Power factor correction is generally unnecessary and there is no danger of damage being done to the control or motor if it is not done. As a result of different power factors between the many makes and models of fan motors, the actual P-Band may be less then the P-Band setting displayed by the control.

If the power factor of the motor is available, use the chart of correction numbers (listed in table 4 below) and CALC 1 below to calculate the P-Band setting required in order to get the desired P-Band. A power factor of 0.8 or greater will cause an insignificant change to the P-Band and does not need to be corrected.

| POWER FACTOR | CORRECTION NUMBERS |
|---|---|
| 1.0 | 1.00 |
| 0.9 | 1.05 |
| 0.8 | 1.10 |
| 0.7 | 1.25 |
| 0.6 | 1.33 |
| 0.5 | 1.60 |

**Table 4**: Power Factor Correction Numbers

CALC 1: P-BAND SETTING = DESIRED P-BAND x CORRECTION NUMBER

Example 1: To have a 6°F P-Band with a motor which has a power factor of 0.7, set the P-Band to 7.5°F (ie. 6°F x 1.25 = 7.5°F).

If the power factor is not known the correction number may be measured. Follow the steps below.

1) Set the Minimum Ventilation parameters (# 2 and 3) to the desired value.

2) Set the P-Band(s) to 10°F (parameters # 5 and 8).

3) Observe the ROOM TEMPERATURE.

4) Adjust the TEMP SET (parameter # 1) to equal the ROOM TEMPERATURE and Stage 2 Start P-Band2 (parameter # 7) to 0. The Stage 1 and Stage 2 fans will now be running just above minimum ventilation.

5) Slowly decrease the TEMP SET (parameter # 1) and listen to the fans increase in speed.

6) Observe the TEMP SET (**FULL SPEED TEMP SET**) at which the motors reach full speed.

7) Use CALC 2 to calculate the Correction number for the motors as follows:

CALC 2:

$$\frac{10^{o}F}{\text{FULL SPEED TEMP SET - ROOM TEMPERATURE}} = \text{Correction number}$$

Example 2: **ROOM TEMP** = 75°F and **FULL SPEED TEMP SET** = 82°F

$$\text{Correction Number} = \frac{10^{o}F}{82^{o}F - 75^{o}F} = 1.43$$

Now use CALC 1 to find the P-Band setting.

# Appendix A - Wiring diagrams

Installation overview ..... A-2
General warnings ..... A-3
Mounting instructions ..... A-4
Grounding and sealing ..... A-4
230 VAC control power ..... A-5
115 VAC control power ..... A-5
Temperature sensor ..... A-6
4-zone averaging ..... A-6
Manually extending sensor ..... A-7
Alarm siren installation ..... A-8
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230 VAC heat/cool stage ..... A-9
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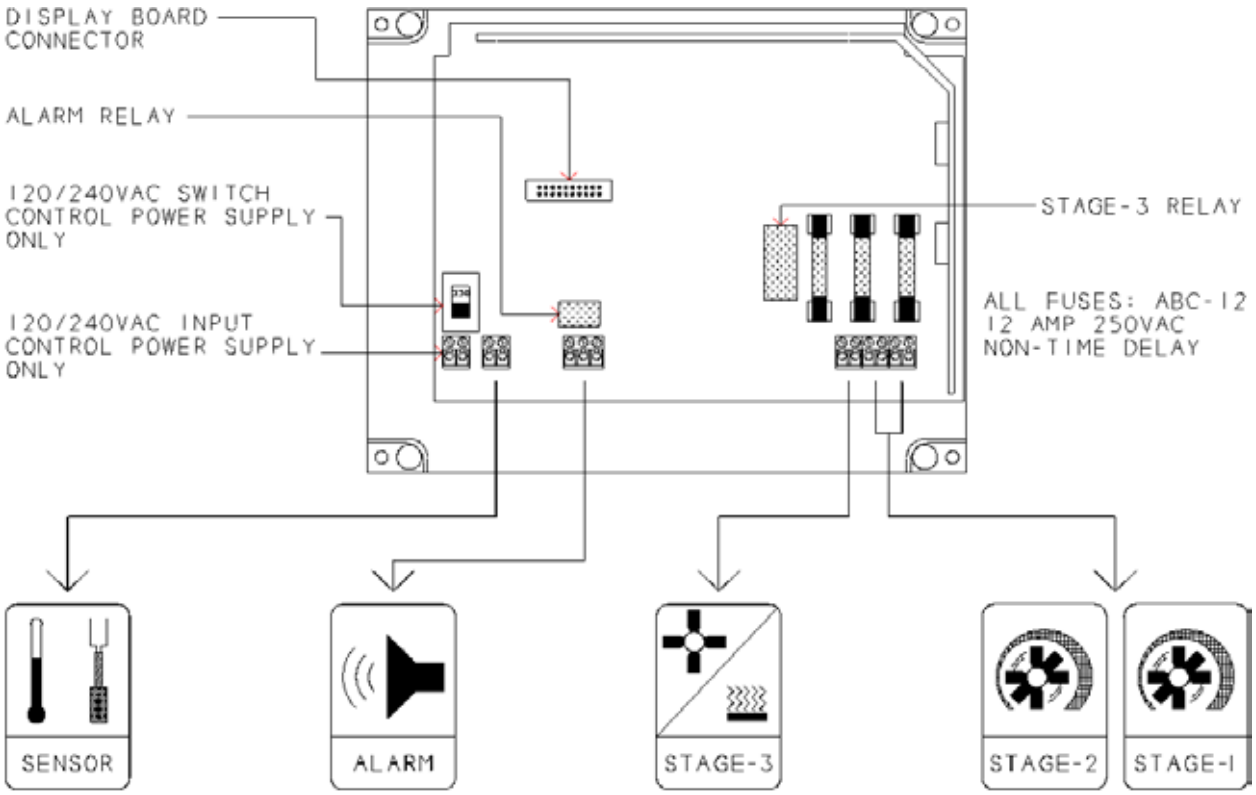
Heat/cool stage furnace-power ..... A-10
Heat/cool stage furnace-thermostat ..... A-10
230 VAC variable speed fan ..... A-11
115 VAC variable speed fan ..... A-11
Correct 3-phase wiring ..... A-12
Incorrect 3-phase wiring ..... A-12
Heat/cool bypass switch ..... A-13

## Installation overview




| | | | |
|---|---|---|---|
| **TEMP SENSOR**<br>See pages A-6 and A-7 for diagrams. | **ALARM RELAY**<br>See page A-8 for wiring an alarm system. | **HEAT / COOL STAGE**<br>See pages A-9 and A-10 for wiring diagrams. | **VARIABLE SPEED STAGES**<br>See page A-11 for wiring diagrams of the variable speed stages. |

Wiring diagrams and instructions for the different stages are located on the pages listed above. First read the General Warnings and Mounting Instructions sections, then follow the diagrams for each stage.

## General warnings

**BE SURE POWER IS OFF BEFORE DOING ANY WIRING.**
The TVS should be installed by a qualified electrician.
Install all equipment according to the applicable local electrical codes.

Most variable speed fan motors draw more current at fractional speeds than at full speed. Fan motor specifications show current draw at full speed. The increase in current draw may be as much as two times the rated current. Current over 7.5 Amps will cause overheating and eventual failure of the TVS. Please check current requirements for the fan motor by either measuring current draw at all speeds from idle to full speed or consult the dealer for information on the particular fan.

**CAUTION:** Stages 1 and 2 are for control of shaded pole, permanent split capacitor or universal motors only.

**ATTENTION:** Destine uniquement a la commande de moteurs universels, a bague de dephasage ou a condensateur permanent.

DO NOT mount power contactors inside the TVS enclosure. Power contactors create electrical noise, which may cause the TVS to work improperly.

Warning: Phason controls are designed and manufactured to provide reliable performance, but they are not guaranteed to be 100% free of defects. Even reliable products may experience occasional failures, and this possibility should be recognized by the user. If Phason products are used in a life support ventilation system where failure could result in loss or injury, the user should provide adequate back-up ventilation, supplementary natural ventilation or an independent failure alarm system. The user's lack of such precautions acknowledges their willingness to accept the risk of such loss or injury.

Electrical noise varies according to the type of equipment installed, the wiring layout and many other factors. It's effects are not apparent in most installations but over time it can cause degradation of electronic circuits, relays and power contactors. These transients can cause unreliable operation of your equipment if they are not properly controlled. A false 'A PF' alarm is due to electrical noise caused by high voltage transients in certain installations. Therefore, snubbing filters must be installed on all inductive loads for installations of this type. The filters must be connected in parallel with the load so the snubbing filter may absorb

## Mounting instructions

To mount the TVS, remove the four screws in the front cover and lift off the cover. The cover can be unplugged from the bottom to make wiring easier. Mount the box to the wall with the four wood screws provided with the control. Insert the screws into the large holes in each corner of the box and tighten.

Use the knockouts provided at the bottom of the enclosure for mounting cable connectors. DO NOT make additional holes in the enclosure - this will void the warranty! All wires should enter the enclosure through the electrical-knockout holes provided and all grounds should be connected to the ground plate. When installing a control route the wires inside away from the control's electronics so that they are not draped across the components. This may result in a part being broken or damaged, which will affect the reliability of your control.

DO NOT mount the bottom enclosure with the electrical-knockouts located at the top of the enclosure. This may cause moisture to enter the control along the wiring and corrode the electronic circuitry, which voids the warranty.

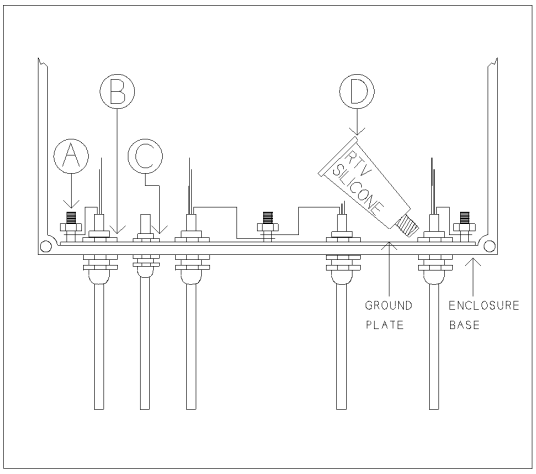
## Grounding and sealing

A - Connect all ground wires to ground studs.

B - Use 3/4" liquid tight wire connectors for large holes.

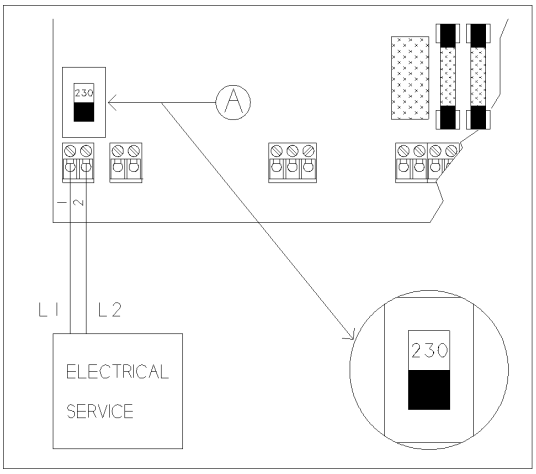
C - Use 1/2" liquid tight wire connectors for small holes.

D - Use RTV silicone or Silicon II sealant to seal cable entry points if liquid tight wire connectors are not used.



If silicone is used, be aware that some silicone sealants release acetic acid while curing. This can cause corrosion damage to the control. Let the silicone cure completely (1 to 3 days) before closing the control or the control may be damaged and the warranty VOID.

## 230 VAC control power

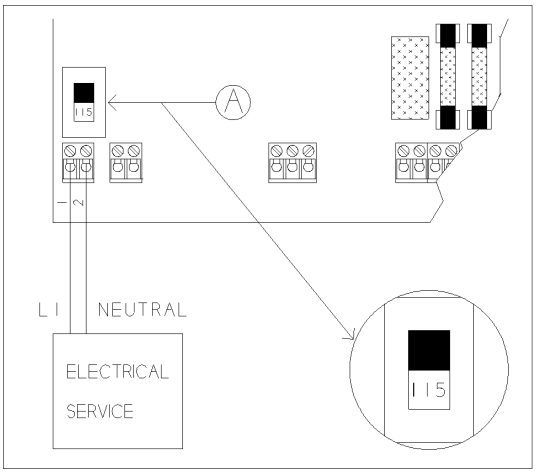



Connect power to terminals 1 and 2.

A - Set switch to 230 VAC position.

See page A-12 for instructions on connecting the TVS to three-phase power.

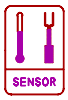
## 115 VAC CONTROL POWER

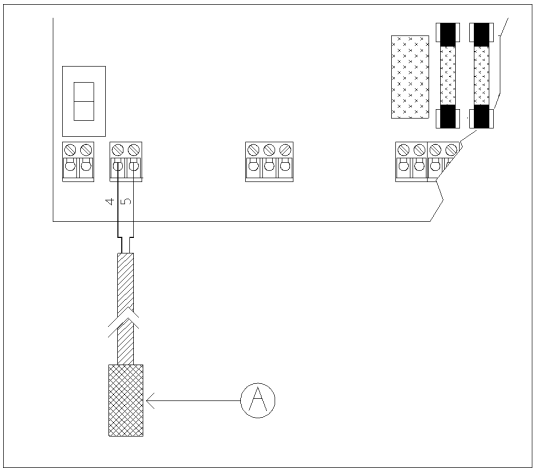



Connect power to terminals 1 and 2.

A - Set switch to 115 VAC position.

## Temperature sensor



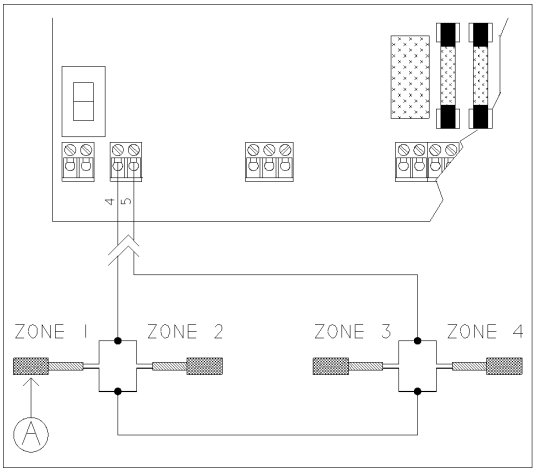




Connect sensor to terminals 4 and 5.

A - The temperature sensor can be extended if so desired. An extended sensor can be ordered from PHASON. To manually extend the sensor, follow the instructions on page A-7.

When installing the extended sensor, do not run the cable next to other power cables and when crossing over other cables, run the sensor perpendicular to them.

## 4-zone averaging

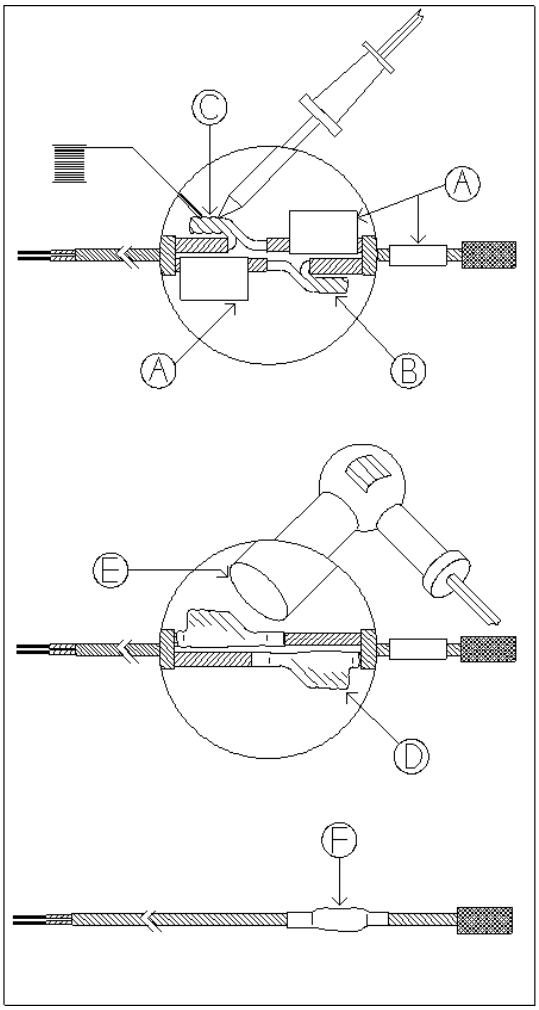



Connect sensor to terminals 4 and 5.

The TVS is capable of monitoring the temperature in four areas and operating accordingly to the average. To take advantage of this option, you must connect four temperature sensors to the unit.

A - The TVS can operate with one or four probes connected.

## Manually extending sensor




To extend the sensor, use 2-wire 18 or 20 AWG jacketed cable. To splice two wires together follow the steps below and refer to the diagram.

A - Slide pieces of heat shrink tubing on the wire ends as shown.

B - Strip the ends of wire and twist together.

C - Using a soldering iron and solder, connect the twisted wire ends together.

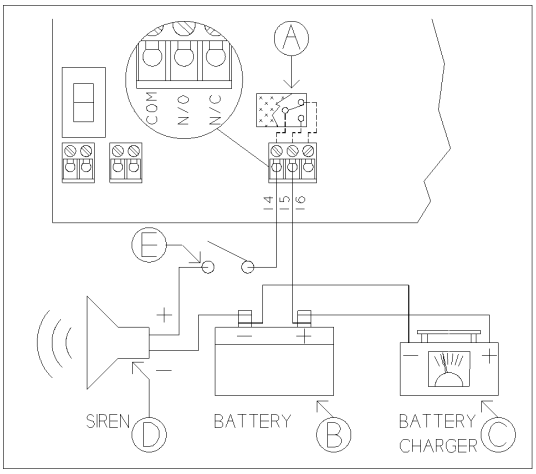
D - Slide the heat shrink tubing over the soldered connection.

E - Heat tubing with a hot air gun (paint stripper).

F - When finished, the splice should be completely sealed.

NOTE: If the unit operates erratically with the extended sensor, try running the extended sensor on a different path or shortening it. Check to be sure that the sensor cable is not run alongside other electrical wires or near electrical equipment. When crossing electrical wires, it is best to cross at 90$^{o}$.

## Alarm siren installation




Connect alarm to terminals 14, 15 and 16.

14 - COMMON
15 - NORMALLY OPEN
16 - NORMALLY CLOSED

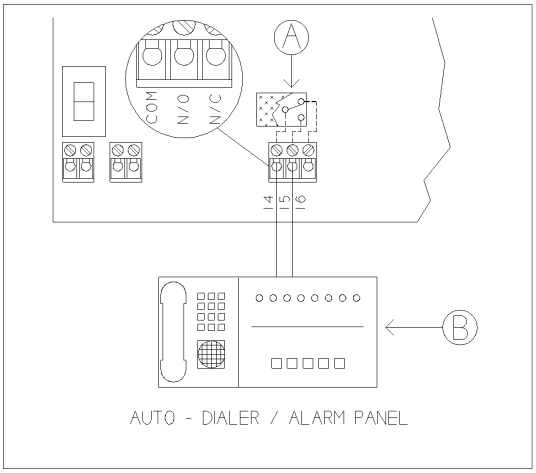
A - See the TVS Electrical Ratings section for the alarm relay ratings.

B & C - Use a backup battery and an appropriate charging system.

D - The siren ratings must not be greater than the alarm relay ratings.

E - Alarm disable switch.

## Alarm panel installation



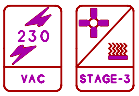

Connect the alarm panel / auto-dialer to terminals 14, 15 and 16.

14 - COMMON
15 - NORMALLY OPEN
16 - NORMALLY CLOSED

A - See the TVS Electrical Ratings section for the alarm relay ratings.

B - Consult the Alarm Panel / Auto-dialer owner's manual for proper installation guidelines.

## 230 VAC heat/cool stage

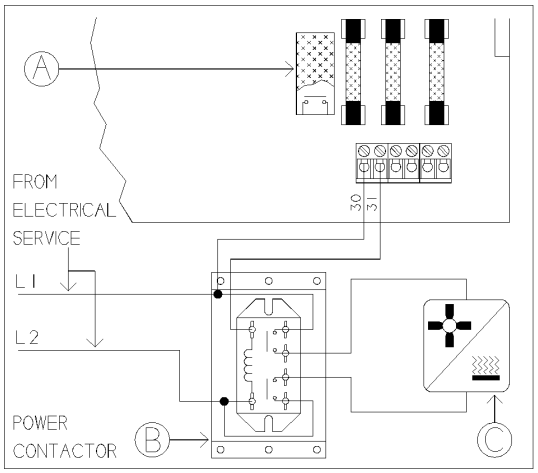



Connect Stage 3 to terminals 30 and 31.

A - Normally Open Relay Contact
Rating: 6 FLA at 230 VAC
Fuse F1: 12 Amp, 250 VAC

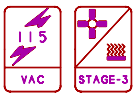
B - 230 VAC power contactor (if required).

C - Load type: fan or heater.



Install according to applicable local electrical codes.

## 115 VAC heat/cool stage

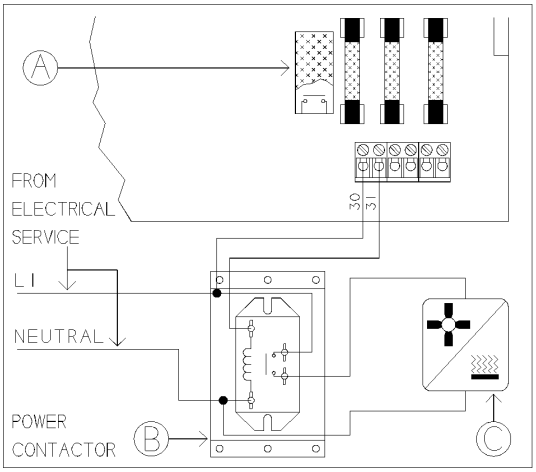



Connect Stage 3 to terminals 30 and 31.

A - Normally Open Relay Contact
Rating: 6 FLA at 115 VAC
Fuse F1: 12 Amp, 250 VAC

B - 115 VAC power contactor (if required).

C - Load type: fan or heater.



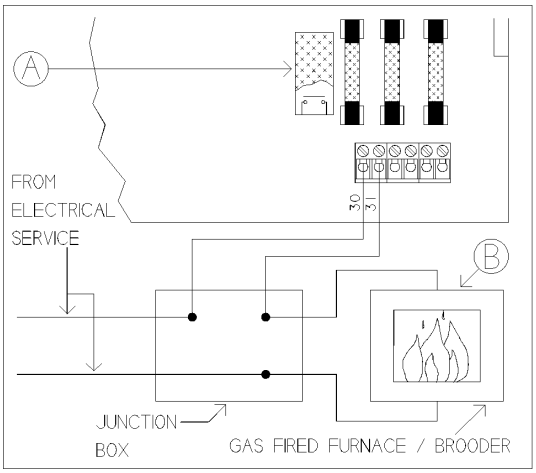
Install according to applicable local electrical codes.

## Heat/cool stage furnace-power

Connect Stage 3 to terminals 30 and 31.

A - Relay Ratings: 6 FLA, 115 or 230 VAC
Fuse F1: 12 Amp, 250 VAC

B - This configuration shows the TVS connected to the power connections for a gas fired furnace or brooder.

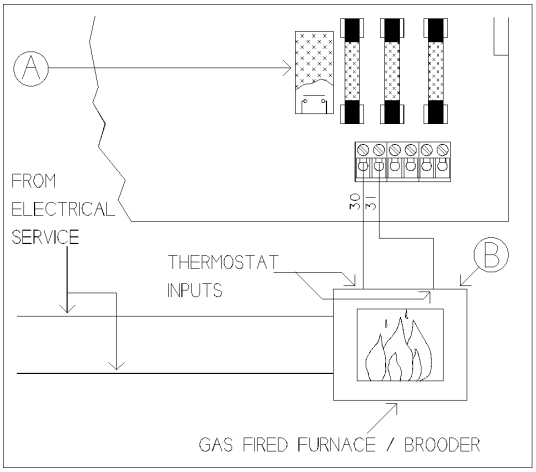



## Heat/cool stage furnace-thermostat

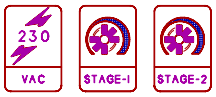
Connect Stage 3 to terminals 30 and 31.

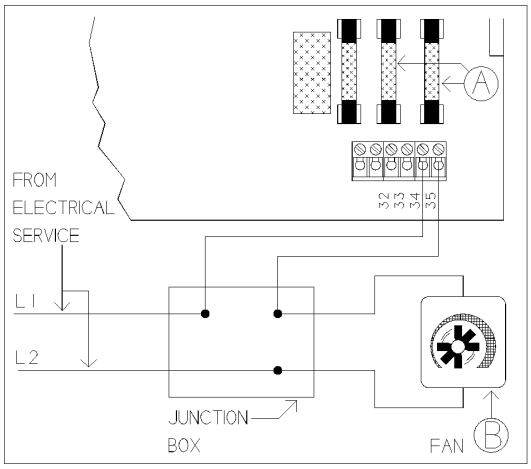
A - Relay Ratings: 6 FLA, 115 or 230 VAC
Fuse F1: 12 Amp, 250 VAC

B - In this configuration the TVS is connected to the thermostat inputs for a gas fired furnace or brooder.



## 230 VAC variable speed fan




Connect Stage 1 to terminals 34 and 35.
Connect Stage 2 to terminals 32 and 33.

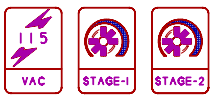
A - Stage 1 and 2 fuse type: 12 Amp, 250 VAC ceramic fuse.

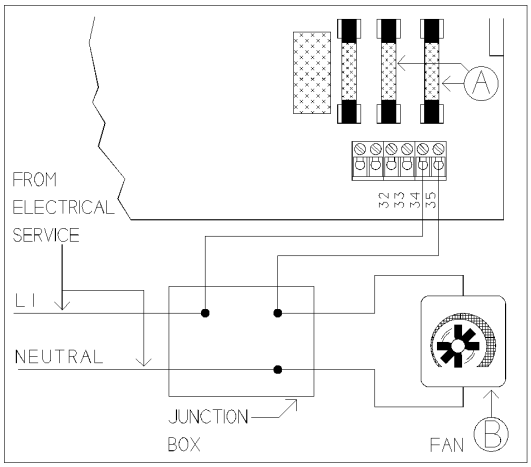
B - Variable speed fan.

Wire according to applicable local electrical codes.

For 3-phase wiring instructions, see page A-12.

## 115 VAC variable speed fan




Connect Stage 1 to terminals 34 and 35.
Connect Stage 2 to terminals 32 and 33.

A - Stage 1 and 2 fuse type: 12 Amp, 250 VAC ceramic fuse.

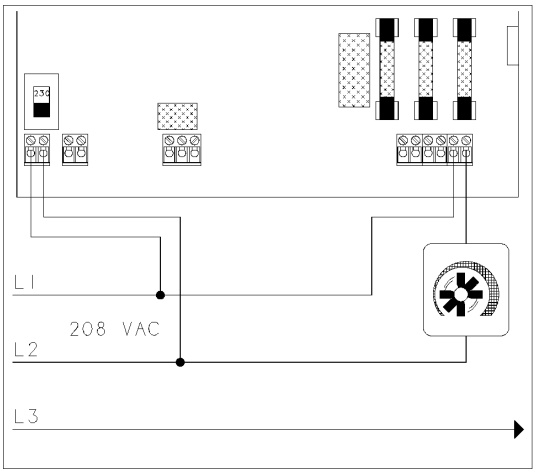
B - Variable speed fan.

Wire according to applicable local electrical codes.

## Correct 3-phase wiring

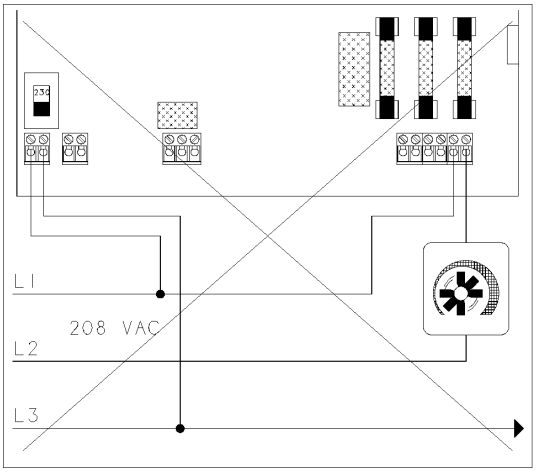
When connecting the TVS to a 3 phase power system, the control power and Stage 1 and 2 must be connected to the same circuit. If this is not done the variable speed fans will run erratically.

DO NOT connect 115 VAC power to terminals 1 and 2 on the TVS and power the fans with 230 VAC.




## Incorrect 3-phase wiring

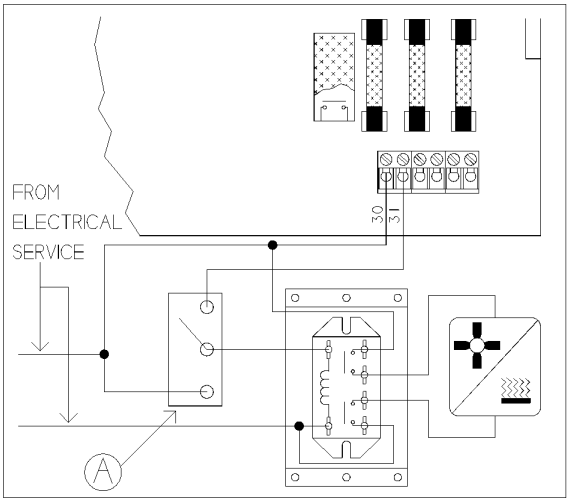
If the control power and the variable speed stages are wired to different phases the fans will operate erratically. This will also happen if the TVS is powered with 115 VAC and the variable speed fans are powered with 230 VAC.



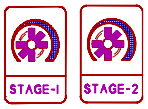
## Heat/cool bypass switch

A - A bypass switch may be installed so the stage can be operated manually, turned off, or controlled automatically by the TVS. When the switch is in the right position the stage will be controlled automatically. When the switch is in the center position the stage will be off, and when the switch is in the left position (manual position) the stage will be fully on.

Connect a "SPDT center off" switch. This switch is included with Phason power contactor units but can also be ordered separately. Note: This switch is NOT a disconnect switch.

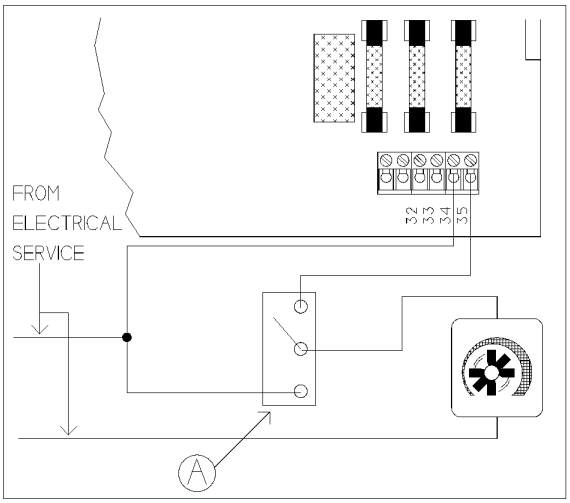



## Variable stage bypass switch




A - A bypass switch may be installed so the fan can be operated manually, turned off, or controlled automatically by the TVS. When the switch is in the upper position the fan will be controlled automatically. When the switch is in the center position the fan will be off, and when the switch is in the lower position (manual position) the fan will be on full speed.

Connect a "SPDT center off" switch. Note: This switch is NOT a disconnect switch.



# Appendix B - Test procedure

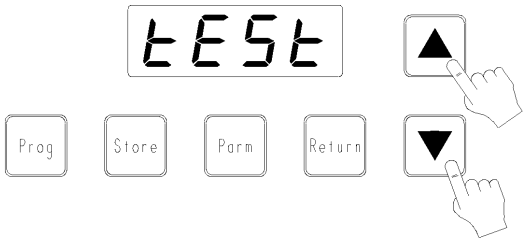
Built-in test procedure ..... B-1
1. Input test ..... B-2
2. Memory test ..... B-2
3. Display test ..... B-2
4. Variable stage test ..... B-2
5. Relay test ..... B-3
6. Reset test ..... B-3

## Built-in test procedure

The TVS has a built in test procedure. The test should be performed after the control has been installed and may be used at any time to check the operation of the control. The test procedure tests the circuitry in the control and tests each stage individually. Follow the instructions below to step through the test procedure.

If an alarm system is connected, be aware that it is normal for the alarm be activated during most of the test procedure.

In order to start the test procedure, the power to the TVS must be off. Then, while holding the **UP** and **DOWN** buttons in, turn on the power. The TVS will start up in the test mode.



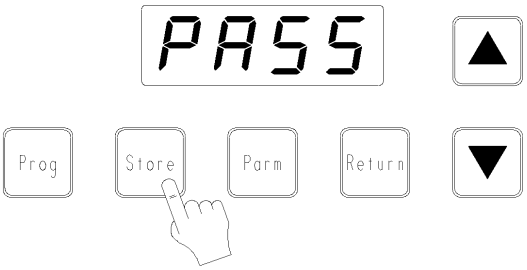
### 1. Input test

Press the **PROG** button once. The TVS will display a number. This number should be between 80.0 and 130.0.

Press the **PROG** button again. The TVS will display the temperature. If the temperature displayed is not correct, make sure that the sensor is installed properly.

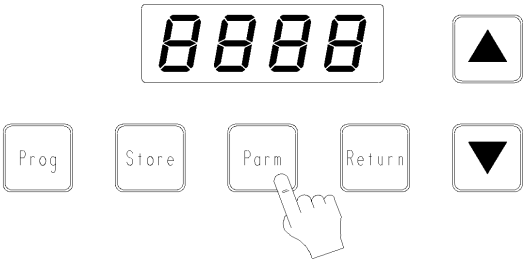
### 2. Memory test

Press the **STORE** button. The TVS will display PASS if the factory programs are in the memory. It will display FAIL if the programs have been changed in any way from the factory settings. See Reloading the Factory Programs under the Adjusting The TVS section in this user's guide to reload the factory programs.



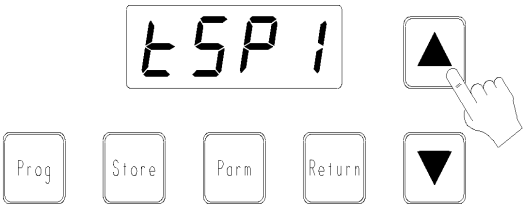

### 3. Display test

Press the **PARM** button to perform the display test. The TVS will display 8888 and then will count from 0 to 9 on each digit. After the display test is done the TVS will display "t ds" which stands for "test display".




### 4. Variable stage test

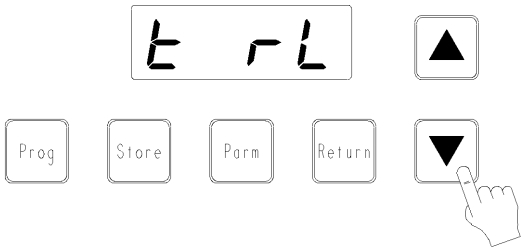
Press the **UP** button once. This will start the variable speed fan test. The display should be flashing tSP1 and oFF ("tSP1" means "test variable speed stage 1"). Press the **UP** button again. Now the display will flash tSP1 and FuLL, and the Stage 1 fan will be running full speed. Press **UP** again and the fan will be running at half speed, and the display will flash tSP1 and HALF. Press **UP** again and the fan will run at low speed.




The display will flash tSP1 and Lo (some fans can not operate at this low speed). Pressing the **UP** button four more times will cycle through the Stage 2 fan test. The display will flash tSP2 and the speed ("tSP2" means "test variable speed stage 2"). The Stage 2 variable speed fan will run at oFF, FuLL, HALF and Lo speeds (like the Stage 1 test). Pressing the **UP** button again will restart the Stage 1 fan test.

### 5. Relay test

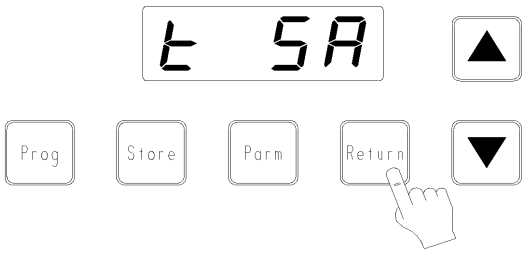
Press the **DOWN** button to start the relay test. The display will flash t rL and ALAr ("t rL" stands for "test relay"), and the alarm should be on. Press the **DOWN** button again and the display will flash t rL and St 3. Now Stage 3 should be on and the alarm will be off. Pressing **DOWN** again will restart the relay test cycle.




If the stage does not function properly when activated, refer to the troubleshooting guide in Appendix C.

### 6. Reset test

Press the **RETURN** button. This will return the TVS to normal operation. The display will flash t SA for one second and then reset ("t SA" stands for "test sanity circuit"). When the control is in normal operation the display will be flashing the room temperature and a power failure alarm (A PF). Press the **RETURN** button to clear the alarm. Other alarms might be displayed if the TVS has not yet been programmed.




This completes the built-in test procedure in the TVS. If at any point during this test the TVS or equipment did not function properly, refer to the troubleshooting guide in Appendix C.

# Appendix C – Troubleshooting guide

Troubleshooting.....C-2

# Troubleshooting

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| No Power/Display | Circuit breaker at service panel off or tripped | Reset circuit breaker |
| | Wiring incorrect | Correct wiring |
| | Display board inter-connect cable unplugged from power supply board | Plug in display board cable |
| | 115/230 VAC switch in the wrong position | Set switch to the correct setting |
| Stage 1/Stage 2 fan(s) not running | Wiring incorrect | Correct wiring |
| | 12 Amp, ABC-12 Fuse(s) open | Replace fuse(s) |
| | Display board inter-connect cable is not plugged into the power supply board properly | Be sure the inter-connect cable is firmly plugged in |
| | Minimum ventilation settings too low (Parameters 2/3) | Increase minimum ventilation settings |
| | Stage 1/Stage 2 Minimum Idle setting too low (Parameters 21/22) | Increase minimum idle setting |
| | Temperature Set setting above room temperature (Parameter 1) | Adjust Temperature Set to desired temperature |
| | Room temperature below range of Stage 1 / Stage 2 Off-Set-Back (Parameters 4/6) | Adjust Off-Set-Back to cover required range |
| | Ventilation is turned off (V off) (Parameter 16) | Change Ventilation to on |
| | Fan is faulty | Replace fan |

| PROBLEM | CAUSE | SOLUTION |
|---|---|---|
| Stage 1/Stage 2 fan(s) run full speed | Wiring incorrect | Correct wiring |
| | Minimum ventilation settings too high (Parameters 2/3) | Decrease minimum ventilation settings |
| | Stage 1/Stage 2 P-Band set to 0 (Parameters 5/8) | Increase Stage 1/Stage 2 P-Band |
| | Room temperature above Temperature Set (Parameter 1) | Adjust Temperature Set to desired temperature |
| Stage 1/Stage 2 fan(s) run erratically | P.F. Compensation is not set correctly | Adjust P.F. Compensation (Parameters 24/25) |
| Stage 3 Relay is not operating loads | Wiring incorrect | Correct wiring |
| | 12 Amp, ABC12 Fuse open | Replace fuse with 12Amp, 250VAC |
| | Display board inter-connect cable is not plugged into the power supply board properly | Be sure the inter-connect cable is firmly plugged in |
| | Turn-on setting for stage is incorrect (Parameter 9) | Adjust Turn-on setting |
| | Wrong Setup parameter selected (Parameter 18) | Correct Setup Parameter setting |
| | Ventilation is turned off (V off) (Parameter 16)<br>Note: This is only applicable to a stage in cooling mode | Change Ventilation to ON |
| | Fan/Heater is faulty | Replace Fan/Heater |
| Alarm relay not operating alarm system | Wiring incorrect | Correct wiring |
| Alarm message on display | Alarm condition present | See Alarm section. Clear alarm condition by pressing RETURN |

# Appendix D – Blank program tables

Blank parameter chart ..... D-2

## Blank parameter chart

When changes to the programs are made the changes should be marked in table 1 below. This will provide a quick reference chart to refer to when reprogramming the TVS in the future.

| # | PARAMETERS | PROGRAM NAMES (A - g) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | A | b | C | d | E | F | G |
| | **MAIN** | | | | | | | |
| 1 | Temp Set (Start P-Band1) | | | | | | | |
| 2 | Stage 1 Min Vent | | | | | | | |
| 3 | Stage 2 Min Vent | | | | | | | |
| | **DIFFERENTIAL** | | | | | | | |
| 4 | Stage 1 Off-Set-Back | | | | | | | |
| 5 | Stage 1 P-Band1 | | | | | | | |
| 6 | Stage 2 Off-Set-Back | | | | | | | |
| 7 | Stage 2 Start P-Band2 | | | | | | | |
| 8 | Stage 2 P-Band2 | | | | | | | |
| 9 | Stage 3 Turn On (Cool) | | | | | | | |
| 10 | Not Applicable | | | | | | | |
| 11 | Not Applicable | | | | | | | |
| 12 | Low Temp Alarm | | | | | | | |
| 13 | High Temp Alarm | | | | | | | |
| | **GENERAL** | | | | | | | |
| 14 | Low Power Alarm | | | | | | | |
| 15 | Alarm Display Latching | | | | | | | |
| 16 | Ventilation | | | | | | | |
| | **SETUP** | | | | | | | |
| 17 | Units $^{o}$F or $^{o}$C | | | | | | | |
| 18 | Stage 3 Operation | | | | | | | |
| 19 | Not Applicable | | | | | | | |
| 20 | Not Applicable | | | | | | | |
| 21 | Stage 1 Minimum Idle | | | | | | | |
| 22 | Stage 2 Minimum Idle | | | | | | | |
| 23 | Hysteresis | | | | | | | |
| 24 | Stage 1 P.F. Compensation | | | | | | | |
| 25 | Stage 2 P.F. Compensation | | | | | | | |

**Table 1:** Blank Parameter Chart